# Characterizing the Environments of Extrasolar Terrestrial Planets by Remote Sensing

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Once an extrasolar terrestrial planet has been resolved from its parent star, and potential biomarkers have been detected in its spectrum, a combination of advanced remote-sensing techniques will be needed to characterize its environment and its potential for habitability. For example, estimates of the temperature and pressure at the planet's emitting surface are needed to assess the stability of liquid water there. If the candidate biomarker is trace gas (e.g. molecular oxygen, ozone, or hydrocarbons), constraints on its vertical distributions are needed to determine whether it can be produced abiotically, or requires a biological origin.

While the remote sensing techniques developed for studies of the Earth and other planets in our solar system provide an excellent starting point in these investigations, limitations in the quality and quantity of the information received from an extrasolar planet will pose special challenges. For example, most remote sensing retrieval methods can be applied only to soundings acquired over a spatially homogeneous scene. Such methods may not be adequate for analyzing observations of an extrasolar planet that is resolved only as a point source, because its spectrum will include contributions from its entire visible hemisphere. To overcome these limitations, new remote sensing methods must be developed to more fully exploit the anticipated information content of extrasolar planet observations. This presentation will provide an overview of existing remote sensing methods and show how they might be augmented to address these new challenges.